effective in suppressing the formation of FAD. No significant effects from either riboflavin or isoriboflavin in the concentrations used in this study are seen with an enzyme dependent on FAD as coenzyme, that is, D-amino-acid oxidase.

The structural dissimilarity of isoriboflavin to riboflavin and FMN, together with a non-competitive rather than competitive type of inhibition against FMN, suggest a different mechanism for interaction of isoriboflavin in systems which require FMN than in the flavokinase system where isoriboflavin is inactive[2-4]. In any event, the gross antagonism of riboflavin by isoriboflavin is attributable to its anti-FMN action, both at the coenzyme level[5] and, as described herein, at the level of conversion of FMN to FAD.

This work was supported by research grant *AM*–04585 from the U.S. Public Health Service.

DONALD B. MCCORMICK

Graduate School of Nutrition,
Cornell University,
Ithaca,
New York.

[1] Emerson, G. A., and Tishler, M., *Proc. Soc. Exp. Biol. Med.*, **55**, 184 (1944).
[2] McCormick, D. B., *J. Biol. Chem.*, **237**, 959 (1961).
[3] McCormick, D. B., and Butler, R., *Biochim. Biophys. Acta*, **65**, 326 (1962).
[4] Kearney, E. B., *J. Biol. Chem.*, **194**, 747 (1952).
[5] McCormick, D. B., *Biochem. Biophys. Res. Comm.*, **14**, 493 (1964).
[6] DeLuca, C., and Kaplan, N. O., *Biochim. Biophys. Acta.*, **30**, 6 (1958).
[7] DeLuca, C., Weber, M. M., and Kaplan, N. O., *J. Biol. Chem.*, **223**, 559 (1956).
[8] Huennekens, F. M., and Felton, S. P., in *Methods of Enzymology*, edit. by Colowick, S. P. and Kaplan, N. O., **3**, 955 (Academic Press, Inc., New York, 1957).

Lipids in the Blood Plasma of Cows of the Friesian and Channel Island Breeds

IN the course of an investigation of the effect of diet on the synthesis of milk fat in the cow, we observed values for the concentration of triglycerides in the blood plasma of cows of the Friesian breed some of which were much lower than the few values available in the literature for lactating Ayrshire[1], Friesian[2] and Jersey[3] cattle. We decided, therefore, to make a preliminary examination of the distribution of the major fractions of lipids in the blood plasma of cows of the Friesian breed, and also, for comparative purposes, of several cows of the Channel Island (Jersey and Guernsey) breeds which have a characteristically higher fat content in their milk.

The lipids were extracted[4] from the plasma and separated by chromatography on silicic acid[5]. The glycerol, cholesterol or phosphorus contents of the resulting fractions, as appropriate, were determined chemically and the values used to calculate the concentrations of the various lipid components. The mean values, with a standard error and the range, for lactating and non-lactating cows of the two breeds are given in Table 1.

The values show higher concentrations of each of the lipid components in the blood plasma for cows of the Channel Island breeds than for cows of the Friesian breed. Also, the concentrations are higher in lactating than non-lactating cows, possibly reflecting differences in feeding, with the exception of the concentration of the triglycerides, which is lower.

The values reported in the literature[1-3] were obtained by weighing the triglyceride fraction and, with one exception[2], are much higher than our own values. The fraction separated by silicic acid chromatography is known to contain small amounts of non-esterified fatty acids, but we have noted an unidentified sterol present in amounts large enough to account for the difference between the values obtained by the two procedures.

The fatty acids of chain length C_4—C_{16} in milk fat, which account for more than half, by weight, of the total fatty acids, are thought to be synthesized within the udder from acetate and β-hydroxybutyrate, but the higher acids, notably stearic acid and the unsaturated acid oleic, have their origin in a minor component of the lipids of the blood plasma[6]. Recent evidence[7] suggests that this component consists of the triglycerides of the chylomicra and low-density lipoproteins which account for about half the total triglycerides of the plasma[2]. The lower concentration of plasma triglycerides which we have found in lactating than in non-lactating animals is consistent with the uptake of triglycerides for synthesis of milk fat. The interesting possibility also arises that the generally higher concentration of plasma triglycerides observed in lactating cows of the Channel Island breeds than in those of the Friesian breed may be an important factor contributing to the higher fat content of the milk of the Channel Island breeds.

We thank Drs. S. J. Rowland and J. H. Moore for their advice and help.

J. E. STORRY
J. A. F. ROOK

Chemistry Department,
National Institute for Research in Dairying,
Shinfield, Reading.

[1] Garton, G. A., and Duncan, W. R. H., *Biochem. J.*, **67**, 340 (1957).
[2] Evans, L., Patton, S. and McCarthy, R. D., *J. Dairy Sci.*, **44**, 475 (1961).
[3] McClymont, G. L., and Vallance, S., *Proc. Nutr. Soc.*, **21**, xli (1962).
[4] Folch, J., Lees, M., and Sloan Stanley, G. H., *J. Biol. Chem.*, **226**, 497 (1957).
[5] Barron, E. J., and Hanahan, D. J., *J. Biol. Chem.*, **231**, 493 (1958).
[6] Glascock, R. F., McWeeny, D. J., and Smith, R. W., in *Radioisotopes in Scientific Research*, **3**, 146 (London, New York and Paris: Pergamon Press, 1958).
[7] Robinson, D. S., Barry, J. M., Bartley, W., and Linzell, J. L., *Biochem. J.*, **87**, 23P (1963).

Table 1. THE CONCENTRATIONS OF LIPIDS (MG/100 ML.) IN THE BLOOD* PLASMA OF LACTATING AND NON-LACTATING COWS OF THE FRIESIAN AND CHANNEL ISLAND BREEDS

Type of cow	No. of animals	Total lipids	Triglycerides†	Cholesterol esters†	Free cholesterol	Phospholipid
Friesian, lactating	9	369 ± 41	6·7 ± 1·0	189 ± 26	26·2 ± 2·9	132 ± 18
		(154 – 534)	(3·1 – 11·1)	(46 – 314)	(5·5 – 46·4)	(36 – 212)
Friesian, non-lactating	4	257 ± 43	12·3 ± 2·5	125 ± 13	17·4 ± 2·1	89 ± 13
		(185 – 380)	(7·8 – 19·0)	(103 – 161)	(14·5 – 23·6)	(71 – 128)
Channel Island, lactating	5	631 ± 66	11·9 ± 1·4	319 ± 40	45·0 ± 5·5	246 ± 28
		(472 – 771)	(7·1 – 14·4)	(222 – 409)	(31·3 – 56·2)	(169 – 300)
Channel Island, non-lactating	4	291 ± 40	17·2 + 2·2	143 ± 24	19·2 ± 3·2	105 ± 17
		(210 – 389)	(12·4 – 21·8)	(94 – 192)	(13·3 – 24·9)	(68 – 147)

* Taken from the jugular vein.
† Expressed as the oleate.

Deamination of the Partially *N*-Deacetylated Mucopolysaccharides

STACEY *et al.*[1,2] reported that the glucosaminidic linkages in several glucosaminides, chitosan and ψ-heparin (*N*-desulphated heparin), were cleaved deaminatively to produce 2,5-anhydromannose as the main product with nitrous acid. Later, similar observations were reported by Matsushima and Fujii[3] on the deamination of the hydrazinolysed product of chondroitin sulphate. On the other hand, Yosizawa and Sato[4,5] presented quantitative data as to the formation of 2,5-anhydrohexoses from *N*-deacetylated hexosamines in the partially *N*-deacetylated mucopolysaccharides by the direct deamination with nitrous acid.

As mentioned in the previous communication[5], more than 60 per cent of the *N*-deacetylated hexosamines in the hydrazinolysed products of sodium chondroitin sulphate *A* and of sodium hyaluronate could not be